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TITLE: IMAGE DISPLAY DEVICE AND MANUFACTURING METHOD OF THE SAME

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ABSTRACT:

PROBLEM TO BE SOLVED: To provide an image display device enabling easy arrangement and reduction of the number of spacers, and easy to assemble, and to provide a manufacturing method of the same.

SOLUTION: An electrode plate 13 and many spacers 15 are installed between a face panel 11 with a phosphor screen 16 formed on it, and with a rear panel 12 with electron emission elements 20. Each spacer extends through spacers holes 14 formed on the electrode plate and makes contact with the face panel at its upper end surface and makes contact with the rear panel at its lower end surface. A stepped part is formed at the middle part of each spacer, and the electrode plate is locked and is positioned at a prescribed position between the panels by contacting with the stepped part.

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image display device equipped with the 1st and 2nd panels which countered, and two or more spacers formed among these panels, and its manufacture approach.
[0002]
[Description of the Prior Art] In the image display device, thin-shape[big-screen-izing, a highly minute display, and]-izing, lightweight-izing, and flat-ization etc. is called for conventionally. However, an image display device with which current fills all demands is not offered. Therefore, development of various image display devices is continued in order to fill the above demands.
[0003] A cathode-ray tube (CRT), a field emission display (FED), a liquid crystal display (LCD), a plasma display panel (PDP), electroluminescence (EL) **, etc. are known by such image display device. It is the display which FED makes excite a fluorescent substance with the electron emitted from the cathode, and obtains luminescence in such an image display device, and since the luminescence principle is the same as CRT, it has the outstanding color reproduction nature equivalent to CRT, gradation, an angle of visibility, and responsibility.
[0004] Usually, FED is equipped with the 1st panel including a phosphor screen, and the 2nd panel containing a cathode, these 1st and 2nd panels place a predetermined clearance, and the opposite location is carried out. And spacing between the 1st and 2nd panels may be able to realize a lightweight large-sized panel with a thin shape from a fixed thing, without being dependent on a screen size. In addition, FED is in the point which arranges many emitters and is made into the electron source to CRT making one cathode the electron source, as for the difference between FED and CRT.
[0005] Usually, in FED, in order to hold spacing of the 1st panel and the 2nd panel, two or more spacers are formed among these 1st and 2nd panels. Moreover, the space between the 1st and 2nd panels is maintained by the high degree of vacuum. Therefore, the spacer must have sufficient mechanical strength so that a panel may not break with the atmospheric pressure added from the panel outside.
[0006] Furthermore, the spacer must be formed so that image grace may not be affected as much as possible. Therefore, a spacer must secure the mechanical strength for holding between panels under constraint of being arranged in the location which is not protruded into a fluorescent substance field to not interrupting the electron which makes a fluorescent substance emit light, and the phosphor screen of the 1st panel.
[0007] Generally, the screen side is constituted by the fluorescent substance field and the black matrix field. As mentioned above, a spacer will be arranged in a screen side to the black matrix field which are locations other than a fluorescent substance field. Since this BURAKKUSU matrix field is width of face of hundreds of micrometers or less, it must also set thickness of a spacer to hundreds of micrometers or less. Usually, if a spacer is the thickness below the width of face of a black matrix field, the electron which makes a fluorescent substance emit light will not be interrupted by the spacer.
[0008] Moreover, FED is classified into a low-battery mold and a high-voltage mold according to an anode electrical potential difference. There should just be a hundreds of micrometers distance between panels required in order to prevent the spark generated between the 1st panel and the 2nd panel since an anode electrical potential difference is 1kV or less in the case of a low-battery mold. On the other hand, since an anode electrical potential difference is set to 1kV or more in the case of a high-voltage mold, in order to prevent a spark, it is necessary to set the distance between panels as several mm. Therefore, in the case of a low-battery mold, the height of a spacer is also hundreds of micrometers and, in the case of a high-voltage mold, is set to several mm.
[0009] In FED of a low-battery mold, the thickness of a spacer is set to hundreds of micrometers or less, and height is

set to hundreds of micrometers or less from the point mentioned above. Such a spacer is realizable with processing of printing, a photosensitive paste, sandblasting, etc.

[0010] On the other hand, in the case of FED of a high-voltage mold, height is set to several mm to thickness of a spacer being hundreds of micrometers. It is difficult to manufacture a spacer with such a high aspect ratio by the same processing approach as the spacer used for a low-battery mold. Therefore, in the case of a high-voltage mold, it is necessary to incorporate the spacer formed with glass, a ceramic, etc. with a precision sufficient on a panel.

[0011] In addition, about the length of a spacer, it is mainly restrained by the configuration of the black matrix field of a phosphor screen. For example, what is necessary is just to make the die length of a spacer below into die length of one side of a panel mostly, if a black matrix field is a stripe configuration. Moreover, when using it for a low-battery mold, the quantity of the spacer to be used is decided by the processing method, and, on the other hand, in the case of the spacer used for a high-voltage mold, is decided by the die length and arrangement spacing of a spacer.

[0012]

[Problem(s) to be Solved by the Invention] In FED of a high-voltage mold which was mentioned above, it is desirable to arrange an electrode plate between the 1st and 2nd panels. This electrode plate is arranged for the purpose of convergence of the electron emitted from the electron source, control of discharge, etc. Moreover, two or more electrode plates may be arranged according to the purpose.

[0013] Generally, the electrode plate is formed in the part which the electron emitted from an electron source passes tabular [with puncturing]. When combining an electrode plate with puncturing of such a large number with a panel, it is necessary to align strictly the aperture of an electrode plate, the fluorescent substance field of a screen side, and the location of an electron source. And when arranging such an electrode plate between panels and a spacer with a height of several mm which was mentioned above is used as it is, there is a problem that a spacer and an electrode plate will interfere.

[0014] Since such a problem is solved, it is possible to divide each spacer, to arrange the 1st spacer between the 1st panel and an electrode plate, and to arrange the 2nd spacer between an electrode plate and the 2nd panel. However, in order to prevent the mechanical strengths of the spacer itself running short in addition to constraint of the arrangement location of the spacer mentioned above in this case, it is necessary to carry out location ****** of the 1st spacer and the 2nd spacer strictly without a location gap. Moreover, compared with the case where an electrode plate is not arranged, the twice [more than] as many spacer number as this is needed. Therefore, while assembly is troublesome, increase of a manufacturing cost is caused.

[0015] This invention was made in view of the above point, and that purpose can reduce the quantity of a spacer while being able to arrange a spacer easily, and assembly is to offer an easy image display device and its manufacture approach.

[0016]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the image display device concerning this invention The 1st panel which has an image display side, and the 2nd panel which countered the 1st panel of the above and has been arranged, It is characterized by having had two or more spacers holding spacing of the electrode plate arranged between the 1st panel and the 2nd panel, and the 1st panel and the 2nd panel, and for the above-mentioned spacer having penetrated the above-mentioned electrode plate, respectively, and having extended between the 1st and 2nd panels of the above.

[0017] Moreover, the 1st panel by which the image display device concerning this invention has an image display side, The electrode plate arranged between the 2nd panel which countered the 1st panel of the above and has been arranged, and the 1st panel and the 2nd panel, It has two or more spacers holding spacing of the 1st panel and the 2nd panel, and the above-mentioned spacer is characterized by having the stop section which stopped the above-mentioned electrode plate in the predetermined location while it penetrated the above-mentioned electrode plate, respectively and is prolonged.

[0018] According to the image display device concerning this invention, while each spacer had the 1st end face which contacted the 1st panel of the above, and the 2nd end face which contacted the 2nd panel of the above and the above-mentioned stop section has countered the 1st or 2nd panel of the above between the 1st panel of the above, and the 2nd panel, the description of having had the stop side which contacted the above-mentioned electrode plate is carried out. Furthermore, the image formation equipment concerning this invention is characterized by having the level difference section which specified the above-mentioned stop side between the 1st and 2nd panels.

[0019] While according to the image formation equipment constituted as mentioned above each spacer penetrated the electrode plate, was prolonged and is in contact with the face panel and the rear panel, each spacer stops with an

electrode plate and holds the electrode plate in the predetermined location. Therefore, while being able to arrange a spacer and an electrode plate easily in a predetermined location, the quantity of a spacer can be reduced, consequently an image display device can be assembled easily.

[0020] Moreover, the 1st panel which has an image display side according to the manufacture approach of the image display device concerning this invention, The electrode plate arranged between the 2nd panel which countered the 1st panel of the above and has been arranged, and the 1st panel and the 2nd panel, the manufacture approach of the image display device equipped with two or more spacers holding spacing of the 1st panel and the 2nd panel -- by being and inserting the above-mentioned spacer in two or more spacer puncturing formed in the above-mentioned electrode plate, respectively While making the above-mentioned electrode plate penetrate, after arranging the electrode plate with which the electrode plate was stopped the spacer, each above-mentioned spacer was fixed to the above-mentioned electrode plate, and the above-mentioned spacer was fixed between the 1st and 2nd panels of the above, it is characterized by fixing the 1st and 2nd above-mentioned panels.

[0021] After other manufacture approaches concerning this invention arrange the above-mentioned spacer on one panel of the 1st and 2nd panels of the above, While arranging the above-mentioned electrode plate with which each spacer was fixed to the panel of the method of Norikazu Kami, and two or more spacer puncturing was formed on the above-mentioned spacer While making the above-mentioned electrode plate penetrate by inserting each spacer in corresponding spacer puncturing, an electrode plate is stopped with a spacer. It is characterized by fixing the above-mentioned spacer and the electrode plate of each other, and fixing the 1st and 2nd above-mentioned panels, after arranging the panel of another side in piles on the panel of the method of Norikazu Kami by whom the above-mentioned spacer and the electrode plate were attached.

[0022] Moreover, according to the image display device concerning this invention, it is considering as the structure where spacer puncturing which the spacer of an electrode plate penetrates, and a spacer are fixed by the fixing member. Moreover, it considered as the structure where an electrode plate and the level difference section of a spacer are fixed by the fixing member. Potential distribution of the fixed-portion circumference can be stabilized by a fixing member having a function as shock absorbing material of the opening section of spacer puncturing and a spacer, and having conductivity further. Moreover, when the fixing member contains frit glass, it shall not be affected to the vacua inside an image display device after immobilization.

[0023] Moreover, the arrangement field of a fixing member is considering as the whole surface of an electrode plate, one side, or the spacer puncturing circumference that a spacer's penetrates, and becomes possible [holding the location-precision of an electrode plate and a spacer uniformly].

[0024] The manufacture approach of the image display device concerning this invention is equipped with the process which fixes the process which carries out the temporary stop of the process which applies a fixing member to an electrode plate, and the level difference section and the electrode plate of the above-mentioned spacer, and the above-mentioned electrode plate and a spacer by the fixing member. The process which applies a fixing member to an electrode plate is characterized by having the process which arranges a masking member with two or more bores corresponding to the above-mentioned spacer puncturing in piles to the above-mentioned electrode plate, and the process which applies a fixing member to the spacer puncturing part of the above-mentioned electrode plate through the above-mentioned masking member.

[0025] Furthermore, the process which applies a fixing member to an electrode plate is characterized by including the process which applies a fixing member all over the above-mentioned electrode plate with which the level difference section of the above-mentioned spacer contacts. In addition, it is good also as a configuration which presses spacer puncturing HESUPESA of an electrode plate fit and is fixed, and a spacer and an electrode plate can be easily fixed in this case.

[0026] Moreover, the manufacture approach of the image display device concerning this invention The 1st panel which has an image display side, and the 2nd panel which countered this 1st panel and has been arranged, In the manufacture approach of the image display device equipped with the electrode plate which has two or more electronic passage puncturing which an electron beam passes, and has been arranged between the 1st panel of the above, and the 2nd panel, and two or more spacers holding spacing of the 1st panel of the above, and the 2nd panel It is characterized by having the process which arranges two or more spacers by which alignment was carried out [above-mentioned] in two or more above-mentioned spacers with the process which aligns to a position beforehand by vibration to one side or the above-mentioned electrode plate of the 1st and 2nd panels of the above.

[0027] Furthermore, it is carrying out having the process which moves the above-mentioned spacer to two or more spacers wearing slot formed in the wearing pallet after aligning the spacer of the above-mentioned plurality [process /

which aligns the spacer of the above-mentioned plurality to a position beforehand by vibration according to the manufacture approach of the image display device concerning this invention] on an alignment pallet in a precision lower than the above-mentioned alignment precision by vibration in the above-mentioned alignment precision as the description.

[0028]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail as an image display device about the gestalt of the operation applied to the field emission display (FED is called hereafter) of a high-voltage mold, referring to a drawing. As shown in drawing 1 thru/or drawing 3 , this FED is equipped with the face panel 11 and rear panel 12 which consist of rectangle-like glass, respectively, these panels place an about 1.5-3.0mm clearance, and opposite arrangement is carried out. And the periphery sections are joined through the rectangle frame-like sealing member 18, and the face panel 11 and the rear panel 12 constitute the vacuum envelope 10 of the shape of a flat rectangle by which the interior was maintained by the vacua.

[0029] The fluorescent substance screen 16 is formed on the inside of the face panel 11 which functions as the 1st panel. This fluorescent substance screen 16 puts red, blue, a green stripe-like fluorescent substance layer, and the black coloring layer of the shape of a stripe as the nonluminescent section in order, and is constituted.

[0030] On the inside of the rear panel 12 which functions as the 2nd panel, the electron emission component 20 of a large number which emit an electron, respectively is formed as a source of electron emission which excites a fluorescent substance layer. These electron emission components 20 correspond for every pixel, and are arranged by two or more trains and the multi-line. Each electron emission component 20 consists of the electron emission section which is not illustrated, a component electrode of the pair which impresses an electrical potential difference to this electron emission section, etc. Moreover, on the rear panel 12, wiring of the a large number book which is not illustrated for impressing an electrical potential difference to the electron emission component 20 is prepared in the shape of matric.

[0031] Moreover, as shown in drawing 2 and drawing 3 , between the rear panel 12 and the face panel 11, many the spacers 15 and the electrode plates 13 for holding spacing between these panels are arranged. When the electrode plate 13 is penetrated, it extends and the both ends contact the face panel 11 and a rear panel 12, respectively, each spacer 15 supports the atmospheric pressure load which acts on these panels, and is maintaining spacing between panels to the predetermined value.

[0032] Moreover, each spacer 15 had the level difference section, and this level difference section is in contact with the top face of the electrode plate 13 so that it may mention later. And the electrode plate 13 is held by many spacers 15 in a predetermined location, and spacing of the face panel 11 and the electrode plate 13 and spacing of a rear panel 12 and the electrode plate 13 are specified correctly. In addition, a predetermined electrical potential difference is impressed to the electrode plate 13 from the power source which is not illustrated.

[0033] As shown in drawing 2 thru/or drawing 4 , the electrode plate 13 has 2nd surface 13b which countered the inside of 1st surface 13a which countered the inside of the face panel 11, and a rear panel 12, and is arranged at the 1st and 2nd panels and parallel. And the electronic passage puncturing 21 of a large number which the electron emitted from the electron emission component 20 passes, and two or more spacer puncturing 14 are formed in the electrode plate 13. The electronic passage puncturing 21 is formed corresponding to the electron emission component 20 of a large number prepared in the rear panel 12.

[0034] The electrode plate 13 is formed in 0.1-0.25mm in thickness by the metal plate of for example, an iron-nickel system. Moreover, the electronic passage puncturing 21 is formed 0.15-0.25mmx0.20-0.40mm in the shape of a rectangle.

[0035] As shown in drawing 2 , drawing 4 , and drawing 5 , each spacer 15 is mostly formed in tabular [rectangular], and the lobe 26 projected outside, respectively is formed in the pars intermedia of both the front face at one. Of these lobes 26, the level difference sections 22a and 22b (the 1st and 2nd stop side) of the pair perpendicularly prolonged to each front face are formed in both the front faces of a spacer 15. The level difference sections 22a and 22b of a pair are mutually prolonged over the overall length of a spacer in parallel on each front face of a spacer 15. And each spacer 15 was inserted in the spacer puncturing 14 of the electrode plate 13, and when lower level difference section 22a contacts 1st surface 13a of an electrode plate has prescribed the location of an electrode plate.

[0036] In addition, in the condition that each spacer 15 has been arranged between the face panel 11 and a rear panel 12, level difference section 22a countered in parallel with a rear panel 12, and level difference section 22b has countered in parallel with the face panel 11.

[0037] Moreover, each spacer 15 has the upper limit side 23 which contacted the face panel 11 through the black

coloring layer of the fluorescent substance screen 16, and the lower limit side 24 which contacted the inside of a rear panel 12. Thickness t of these vertical end faces 23 and 24 is formed in hundreds of micrometers or less.

[0038] In the gestalt of this operation, since the black coloring layer of the fluorescent substance screen 16 is a stripe configuration, the spacer 15 is arranged so that the longitudinal direction may be in agreement with the longitudinal direction of a stripe. And die-length L of a spacer 15 is formed in dozens of mm from several mm. Moreover, although arrangement spacing of the spacer 15 of two ****** changes with the die length of a spacer 15 along the direction of a stripe of the fluorescent substance screen 16, it is mostly set as dozens of mm. Furthermore, since FED concerning the gestalt of this operation is a high-voltage mold, height h of a spacer 15 is set as several mm in order to prevent discharge between the face panel 11 and a rear panel 12.

[0039] Even when the location gap of each spacer 15 is carried out within a design allowed value, since it is a vacua, it is necessary between that the upper limit side 23 of a spacer 15 does not overflow the field of a black coloring layer into a fluorescent substance layer field and the face panel 11, and a rear panel 12 to have only the mechanical strength which spacer 15 the very thing does not destroy by the atmospheric pressure load added from the exterior. Thickness t of a spacer 15 is set up so that these conditions may be fulfilled. Therefore, as for thickness t of the upper limit side 23, it is more desirable than the stripe width of face of a black coloring layer to make it small by the location gap design permissible dose of a spacer 15.

[0040] Moreover, although the whole thickness d becomes large rather than thickness t of the vertical end faces 23 and 24 about the level difference sections 22a and 22b of a spacer 15, it must be made only the thickness which does not interrupt the electronic passage puncturing 21 of the electrode plate 13.

[0041] On the other hand, the spacer puncturing 14 of the electrode plate 13 is formed with the design complementary tolerance which can penetrate a spacer 15 at the time of the assembly of FED. Moreover, in order to specify strictly spacing with the electrode plate 13, the face panel 11, and a rear panel 12, it is desirable to enlarge the touch area of level difference section 22a of a spacer 15 and the electrode plate 13 as much as possible. Therefore, while enlarging thickness d of level difference section 22a in less than hundreds of micrometers to thickness t of the vertical end faces 23 and 24, as for the spacer puncturing 14 of the electrode plate 13, it is desirable to consider as the configuration made large [10 micrometers of numbers], respectively to thickness t and die-length L of the vertical end faces 23 and 24 of a spacer 15.

[0042] Furthermore, in order to take large design complementary tolerance, as for the level difference sections 22a and 22b of a spacer 15, it is desirable to enlarge a touch area with the electrode plate 13 as much as possible. Therefore, as for a level difference root part and a level difference edge part, considering as the configuration of a straight-line configuration is desirable. It is decided by distance with the electrode plate 13, a face panel, or a rear panel, and the distance to the vertical end faces 23 and 24 and the level difference sections 22a and 22b of a spacer 15 can be freely changed according to the purpose of the electrode plate 13.

[0043] Moreover, as shown in drawing 2 and drawing 5 , the cross-section configuration where it met in the height direction of each spacer 15 is a vertical symmetry configuration. By making a spacer 15 into such a configuration, constraint of the upper and lower sides in the height direction of a spacer 15 is lost in combination with the face panel 11, a rear panel 12, and the electrode plate 13.

[0044] After the time of the assembly of the electrode plate 13 and the 1st and 2nd panels 11 and 12 or the vacuum envelope 10 interior will be in a vacua, it is necessary to make it the electrode plate 13 not move from a predetermined location within a vacuum envelope in FED of such structure. Therefore, the electrode plate 13 and the spacer 15 are being fixed by the fixing member 40 with which it filled up in the spacer puncturing 14.

[0045] If it states to a detail, as shown in drawing 6 , each spacer puncturing 14 of the electrode plate 13 is formed from the opening area by the side of 1st surface 13a of an electrode plate, i.e., the opening area by the side of the top face of the electrode plate with which level difference section 22a of a spacer 15 touches, so that the direction of the opening area by the side of the electrode plate inferior surface of tongue which does not contact a spacer may become large. Therefore, the inside of each spacer puncturing 14 has the inclined plane 42 which inclined outside toward the direction which a spacer 15 penetrates. By having such an inclined plane 42, the fixing member 40 can be easily arranged to the location suitable for immobilization with the electrode plate 13 and a spacer 15. An inclined plane 42 is easily realizable by forming the spacer puncturing 14 of the electrode plate 13 by etching etc. In addition, according to the manufacture approach of the electrode plate 13, an inclined plane 42 has a lobe in a part of direction of board thickness of a plane or the electrode plate 13, and may serve as a configuration.

[0046] A spacer 15 mainly consists of glass material, and the electrode plate 13 mainly consists of conductive metals. Therefore, the fixing member 40 which fixes these members of each other needs to consist of ingredients with an

adhesive property to the electrode plate 13 and a spacer 15. Moreover, the fixing member 40 needs to choose the ingredient which does not have a bad influence by degasifying etc. to the vacua in the vacuum envelope 10.
[0047] Furthermore, after the electrode plate 13 and a spacer 15 are fixed, while carrying out a thing and making it not become a source of discharge, the property with the surface state of the fixing member 40 exposed to a panel inside smooth as much as possible which does not disturb potential distribution of the fixing member 40 circumference as much as possible is required. It is suitable to use conductive frit glass as a fixing member 40 from a selection condition which was mentioned above.
[0048] The electrical potential difference of several kV is impressed to the electrode plate 13 at the time of actuation of FED. Moreover, predetermined resistance is given to each spacer 15. Thereby, potential distribution of the spacer 15 neighborhood was stabilized, and while having controlled the bad influence of electronic BIMUHE emitted from an electron source, it has controlled that a spacer 15 serves as a source of discharge. If these points are taken into consideration, the fixing member 40 will not produce a big problem, in order to form the less than dozens of micrometers uniform electric conduction film on the electrode plate 13, even if it is arranged in the location of electrode plate 13 throat, since it is conductivity.
[0049] However, if the fixing member 40 is arranged in the large range of a spacer 15, the roughness and fineness of potential distribution will be produced around spacer 15. Therefore, as shown in drawing 6 , the fixing member 40 is arranged only near level difference section 22a of a spacer 15, and is considered as the configuration which is not arranged at other parts of a spacer 15.
[0050] Drawing 7 shows potential distribution when the fixing member 40 covers the large field of a spacer 15 and has been arranged to it. If it is the arrangement condition of such a fixing member 40, the potential of the electrode plate 13 will approach a rear panel 12 by the fixing member 40 connected electrically. Therefore, change of potential will become rapid from other parts between the fixing member 40 and a panel 12, and the high potential difference will arise on the front face of a spacer 15. For this reason, a spacer 15 may serve as a source of discharge, and arrangement of such a fixing member 40 does not have it. [desirable]
[0051] Therefore, as for arrangement of the fixing member 40 to a spacer 15, it is desirable to consider as the range below the board thickness of the electrode plate 13 from level difference section 22a of a spacer 15. Moreover, in the range in which the electrode plate 13 and a spacer 15 are certainly fixed, by lessening the amount of the fixing member 40 used as much as possible, the property of FED cannot be affected and the cost of the fixing member 40 can be held down to coincidence.
[0052] On the other hand, the spacer puncturing 22 of the electrode plate 13 has the dimensional amount of allowances of dozens - 100 micrometers of numbers to the spacer in order to make a spacer 15 penetrate. Therefore, as shown in drawing 8 , a spacer 15 can consider being biasedly arranged in the range of the above-mentioned amount of allowances to the spacer puncturing 14. In such a case, the arrangement location of the fixing member 40 is different on both sides of a spacer 15. If a spacer 15 inclines, distance with an electron beam will become near in the partial direction, and the distance of the fixing member 40 and an electron beam will become near similarly. In this case, in the part in which the fixing member 40 approached the electron beam, since potential distribution coming to be equalized more and the fixing member 40 are conductivity, if the amount of the fixing member 40 used is chosen appropriately, a problem will not be produced.
[0053] Next, the manufacture approach of FED constituted as mentioned above is explained. First, as shown in drawing 3 , the face panel 11, a rear panel 12, the electrode plate 13, and many spacers 15 are prepared. The fluorescent substance screen with a fluorescent substance layer and a black protection-from-light layer is beforehand formed in the inside of the face panel 11. Moreover, on the rear panel 12, many electron emission components 20, wiring, etc. are formed. The electrode plate 13 is put on the desk superiors from which the physical relationship of the electronic passage puncturing 21 and the spacer puncturing 14 becomes clear beforehand in somewhere else.
[0054] Then, many spacers 15 are inserted in the spacer puncturing 14 of the electrode plate 13, respectively, and level difference section 22a is made to contact 1st surface 13a of the electrode plate 13, as shown in drawing 9 . Thereby, as for each spacer 15, physical relationship with the electrode plate 13 is specified in a predetermined relation. In this condition, each other is fixed and it unifies so that the physical relationship of a spacer 15 and the electrode plate 13 may not be changed. A fixed location serves as the spacer puncturing 14 and the level difference section 22a circumference. Conductive frit glass is used as a fixing member 40.
[0055] Here, the process which inserts a spacer 15 in the spacer puncturing 14 of the electrode plate 13, and the process which fixes a spacer and an electrode plate are explained to a detail. First, when the insertion process of a spacer 15 is explained and the die length of a spacer 15 is several mm like this example, the spacer arranged to the

vacuum envelope 10 interior becomes tens of thousands of pieces from thousands of pieces. It becomes very difficult about the spacer of such a large number one piece or for it to be able to stand in a line every partly by a robot etc. Then, according to the gestalt of this operation, it aligns to a position beforehand by vibrating many spacers 15 laid on the pallet.

[0056] As shown in drawing 10 , the oscillating array apparatus 50 used for alignment of a spacer 15 is equipped with the holder 54 which arranges a pallet 52, and the oscillating generating section 55 which vibrates this holder to X and Y which go direct mutually, and a Z direction. And many spacers 15 are fed into a part of holder 54.

[0057] As shown in drawing 11 and drawing 12 , while the pallet 52 is formed in the rectangle tabular corresponding to the electrode plate 13, two or more guide hollows 56 which extended along the array direction of a spacer 15 are formed in the top face. Furthermore, the spacer arrangement slot 57 for arranging a spacer 15 is formed in each guide hollow 56 according to the location of the spacer puncturing 14 of the electrode plate 13. That is, the spacer arrangement slot 57 is formed at the almost same spacing as spacer arrangement spacing of electrode plate 13 HE. Moreover, it is required that it should prevent breakage of a spacer 15 while it is required that the spacer arrangement slot 57 and the guide hollow 56 should be configurations which are easy to align a spacer 15. Therefore, the edge parts of the spacer arrangement slot 57 and the guide hollow 56 are beveled, or are processed into the curved-surface configuration.

[0058] And in a production process, the pallet 52 with which many spacers 15 were thrown in is laid on a holder 54, and a pallet 52 and a holder 54 are vibrated about acceleration 0.5-1.5G to arrow heads X and Y and a Z direction. Thereby, vibrating, as shown in drawing 11 , as it moves and a pallet 52 top is shown in drawing 13 and drawing 14 , each spacer 15 is inserted in a spacer 15 into the spacer arrangement slot 57, and it is arranged by position relation in the state of a standing position. The time amount to vibrate is set up in several or less minutes. In addition, it is not desirable to give a strong vibration to the extent that a spacer 15 separates from the front face of a pallet 52, in order to be anxious about destruction, elutriation from a holder 54, etc. of a spacer.

[0059] In case oscillating alignment of the spacer 15 is carried out, in order to arrange a spacer 15 efficiently into the spacer arrangement slot 57, it is desirable to, pass the spacer arrangement slot 57 top of a pallet 52 for many spacers 15 if possible by vibration. Therefore, as for the spacer input to a holder 54, it is desirable to set up about 5 to 10 times to the quantity of the spacer 15 actually arranged in the spacer arrangement slot 57. Moreover, since the shallow guide hollow 56 is formed around the spacer arrangement slot 57, the large majority of the spacer 15 fed into the holder 54 can pass now through the guide hollow 56, can lead a spacer 15 to the spacer arrangement slot 57 efficiently, and can align efficiently.

[0060] In addition, it becomes difficult from the principle of operation of oscillating alignment for all the spacers 15 to be arranged by oscillating alignment in the spacer arrangement slot 57. Usually, it will be in the condition that several% of spacer total is not arranged. So, with the gestalt of this operation, the spacer arrangement slot 57 where the spacer 15 is not arranged is detected, and additional arrangement of the spacer 15 is carried out by a robot or a help etc. who does not illustrate.

[0061] According to the alignment approach mentioned above, a pallet 52 is vibrated, easily, it can align and a spacer 15 can be arranged now. However, alignment may become difficult with the posture in which a spacer 15 is arranged by vibration in the spacer arrangement slot 57, and the configuration of a spacer.

[0062] Then, it uses combining two or more pallets, and where a spacer 15 is laid down, after carrying out oscillating alignment, the approach of changing the sense and aligning in the standing position condition can also be taken. If it states to a detail, as shown in drawing 15 and drawing 16 , alignment pallet 52a will be first laid on the holder 54 of the same oscillating array apparatus 50 as the above. In this case, while alignment pallet 52a is formed in the rectangle tabular corresponding to the electrode plate 13, two or more guide hollows 56 which extended along the array direction of a spacer 15 are formed in that top face. And the spacer arrangement slot 57 for arranging a spacer 15 is formed in the guide hollow 56. Here, each spacer arrangement slot 57 is formed in the configuration contained in the condition which laid down the spacer 15, i.e., a condition almost parallel to the front face of alignment pallet 52a. In addition, the inhalation-of-air hole 60 for vacuum suction is formed in the bottom of each spacer arrangement slot 57.

[0063] And in a production process, alignment pallet 52a into which many spacers 15 were thrown is laid on a holder 54, and alignment pallet 52a and a holder 54 are vibrated. Thereby, a spacer 15 moves in a pallet 52 top, vibrating, is inserted into the spacer arrangement slot 57, and is arranged by position relation in the condition of having lain. If it is the configuration and alignment posture of such a spacer 15, a spacer 15 can be easily aligned at the almost same spacing as spacer arrangement spacing as if alignment pallet 52a is vibrated, be alike.

[0064] Then, alignment pallet 52a by which the spacer 15 has been arranged is combined with posture rotation pallet 52b and loading pallet 52c. As shown in drawing 16 , posture rotation pallet 52b has the guide hole 61 of a large number corresponding to the spacer arrangement slot 57 of alignment pallet 52a, and a part of inside of each guide hole has the sloping guide side 62. Moreover, the spacer loading slot 64 for arranging a spacer 15 in the standing position condition is formed in loading pallet 52c according to the location of the spacer puncturing 14 of the electrode plate 13. That is, the spacer loading slot 64 is formed at the almost same spacing as spacer arrangement spacing of electrode plate 13 HE. Furthermore, the inhalation-of-air hole 65 for vacuum suction is formed in the bottom of each spacer loading slot 64.

[0065] In a production process, posture rotation pallet 52b is arranged in piles to loading pallet 52c, and alignment pallet 52a by which the spacer 15 has been arranged is further arranged in piles to posture rotation pallet 52b. Under the present circumstances, the spacer 15 with which alignment pallet 52a was loaded is held in the condition of carrying out vacuum suction beforehand, and not sticking fast and moving.

[0066] And where location ****** of alignment pallet 52a, posture rotation pallet 52b, and the loading pallet 52c is carried out, the vacuum suction of each spacer 15 is canceled. Then, a spacer 15 falls in the guide hole 61 of posture rotation pallet 52b from the spacer arrangement slot 57 of alignment pallet 52a, and changes a slanting posture with guide sides 62. Furthermore, each spacer 15 is led to the loading slot 64 of loading pallet 52c by the guide side 62, and, finally is arranged in the state of a standing position into the loading slot 64 of loading pallet 52c. The configuration of this loading pallet 52c is the almost same configuration as the pallet 52 mentioned above, and the spacer 15 which aligned at loading pallet 52c is combined with the electrode plate 13 at degree process.

[0067] In addition, in case the loading slot 64 of loading pallet 52c is loaded with a spacer 15, it may be made to carry out vacuum suction of the spacer 15 through the inhalation-of-air hole 65. Moreover, location precision of the spacer arrangement slot 57 established in alignment pallet 52a can also be made low as compared with the loading slot 64 established in loading pallet 52c. Even in this case, by raising location precision by posture rotation pallet 52b, the location precision of loading pallet 52c can be satisfied, and a spacer 15 can be arranged. Moreover, what is necessary is to prepare two or more other posture rotation pallets with which a configuration differs from location precision, to arrange in the middle of alignment pallet 52a and loading pallet 52c, and just to combine, when a problem is in posture rotation and location precision.

[0068] And as shown in drawing 17 , alignment of the spacer 15 which aligned as mentioned above at a pallet 52 or loading pallet 52c is carried out to the electrode plate 13, and it is fixed to an electrode plate after inserting in the spacer puncturing 14 of the electrode plate 13. Here, the mark for alignment which is not illustrated is prepared in a pallet 52 or 52c, and the electrode plate 13, and precision can improve these mutually alignment to them.

[0069] Although it is desirable to constitute from the pallet 52 of one sheet or 52c corresponding to the electrode plate 13 in one sheet in order to simplify a combination process, it is also possible to put in order and constitute the pallet of two or more sheets to one electrode plate 13 by constraint about oscillating alignment of a pallet. The electrode plate 13 is stopped by level difference section 22a of a spacer 15, and maintains fixed spacing. By performing immobilization with the electrode plate 13 and a spacer 15 in this condition, the electrode plate 13 and a spacer 15 can form the electrode plate with a spacer unified with a sufficient precision.

[0070] In addition, when it fixes the electrode plate 13 and a spacer 15, the fixing member 40 is beforehand applied to the spacer puncturing 14 of the electrode plate 13 according to the following processes. First, as shown in drawing 18 , the masking plate 70 is stuck and arranged on 2nd surface 13b of the electrode plate 13. Opening 71 is formed only in the part which laps with the masking plate 70 with the spacer puncturing 14. And where alignment of the electrode plate 13 and the masking plate 70 is carried out, with spray coating cloth equipment 72, it sprays and the conductive frit glass as a fixing member 40 from the masking plate 70 side is applied only to the spacer puncturing 14 of the electrode plate 13. In addition, the method of application of the fixing member 40 is designing appropriately not only a spray method but a masking plate, and spreading by printing is also possible for it.

[0071] Moreover, even if it applies the fixing member 40 to the electronic passage puncturing 21 of the electrode plate 13, when not becoming a problem, it is also possible to exclude a masking plate and to apply the fixing member 40 to the electrode plate 13 directly. In this case, since the alignment of the masking plate 70 and the electrode plate 13 etc. becomes unnecessary, the large simplification of a process is realizable. In addition, the fixing member 40 may be applied all over the electrode plate 13 in this case.

[0072] Next, in the condition of having adhered to the electrode plate 13, according to the process mentioned above, the fixing member 40 inserts a spacer 15 in the spacer puncturing 14 of the electrode plate 13, and arranges in a predetermined location. In this case, as shown in drawing 19 , it is applied so that a spacer 15 may not serve as

hindrance which penetrates the spacer puncturing 14 of the electrode plate 13, and the electrode plate 13 and level difference section 22a of a spacer 15 contact, and the fixing member 40 specifies the physical relationship of the height direction. In this condition, a spacer 15 and the fixing member 40 hardly touch.

[0073] Then, since the fixing member 40 is a frit, it calcinates the fixing member 40, maintaining the condition which shows in drawing 19 , and fixes it with the electrode plate 13 and a spacer 15 by this fixing member 40. Since the electrode plate 13 and a spacer 15 are also calcinated by coincidence, it is necessary to make it not change the physical relationship of the electrode plate 13 and a spacer 15 by baking at a baking process. Therefore, the process which carries out temporary immobilization of the electrode plate 13 and the spacer 15 by charge for temporary immobilization of a binder with the another fixing member 40 etc., and burning tools are used.

[0074] The fixing member 40 will be in the condition of softening once in the high temperature field at the time of baking, and having a fluidity, and will flow to near level difference section 22a of a spacer 15. In order to utilize the fluidity of the fixing member 40, the spacer 15 and the electrode plate 13 are arranged at the time of baking so that the fixing member 40 may be located above level difference section 22a of a spacer 15.

[0075] Moreover, by baking, the electrode plate 13 and a spacer 15 come to have the fixing member 40 and sufficient bond strength, and the front face of the fixing member 40 will become smooth. After baking, the fixing member 40 is fixed and the electrode plate 13 and a spacer 15 are unified as an electrode plate 30 with a spacer shown in drawing 9 .

[0076] Next, the electrode plate 30 with a spacer which unified the spacer 15 and the electrode plate 13 is arranged on a rear panel 12. In that case, to the electron emission component 20 of a rear panel 12, it positions and arranges so that the electronic passage puncturing 21 of the electrode plate 30 with a spacer may serve as suitable relation. In this case, since the electrode plate 30 with a spacer can be dealt with as one member, the whole positioning of it is attained by carrying out alignment of several places of an electrode plate to a rear panel 12. Moreover, the electrode plate 30 with a spacer will be in a condition also with the suitable physical relationship of a spacer 15 and a rear panel 12, if the electrode plate 13 is appropriately arranged to a rear panel 12, since it is unified where the physical relationship of a spacer 15 and the electrode plate 13 is specified. And after positioning is completed, these are mutually fixed so that the physical relationship of a rear panel 12 and the electrode plate 30 with a spacer may not be changed.

[0077] It combines so that the face panel 11, a rear panel 12, and the electrode plate 30 with a spacer may serve as suitable physical relationship, and the periphery sections of a face panel and a rear panel are joined to the last by the sealing member 18. Then, FED is completed by making between the face panel 11 and rear panels 12 into a vacua.

[0078] In addition, if between panels will be in a vacua, an atmospheric pressure load will join each spacer 15 from the panel exterior. And since an atmospheric pressure load is fixed mutually, the face panel 11, a rear panel 12, and a spacer 15 are not necessarily required for other fixed means by the charge of a binder etc.

[0079] Next, other manufacture approaches of the above-mentioned image display device are explained. According to this manufacture approach, as shown in drawing 20 , many spacers 15 are arranged on the face panel 11 by which the fluorescent substance screen was formed beforehand. In this case, a spacer 15 is arranged on the black protection-from-light layer of a fluorescent substance screen. Moreover, one piece thru/or the approach of arranging to the position on a fluorescent substance screen in the unit partly are taken for a spacer 15 in this case. Or after carrying out alignment arrangement of many spacers using the pallet mentioned above and oscillating array apparatus, you may arrange on a fluorescent substance screen.

[0080] In case each spacer 15 is arranged on the face panel 11, fixing to coincidence is desirable. As mentioned above at that time, each spacer 15 needs to arrange and fix to thickness t being hundreds of micrometers, so that the inclination of a spacer 15 may become small as much as possible to the face panel 11 since height h is the configuration of a high aspect ratio of several mm. The charge of a binder which is not illustrated is used for this immobilization as a holddown member.

[0081] After fixing a spacer 15 to the face panel 11, the electrode plate 13 is arranged on a spacer 15, and the spacer [/ in each spacer puncturing 14] 15 is inserted in. And the electrode plate 13 is made to contact level difference section 22a of each spacer 15, and is positioned in a predetermined location. Under the present circumstances, since the location of the electrode plate 13 is automatically specified if only a spacer 15 penetrates the spacer puncturing 14 of the electrode plate 13, complicated alignment equipment etc. becomes unnecessary.

[0082] The spacer 15 of total is inserted in the spacer puncturing 14 of the electrode plate 13, and after checking that the electrode plate 13 and level difference section 22a of a spacer 15 have contacted, the electrode plate 13 and a spacer 15 are fixed. Then, the face panel 11 and a rear panel 12 are arranged so that it may become suitable physical

relationship, and the periphery sections are joined by the sealing member 18. Then, FED is completed by making between the face panel 11 and rear panels 12 into a vacua.

[0083] While according to the pixel display constituted as mentioned above and its manufacture approach each spacer penetrated the electrode plate 13, was prolonged and is in contact with the face panel and the rear panel, each spacer engages with an electrode plate and holds the electrode plate in the predetermined location. Therefore, while being able to arrange a spacer and an electrode plate easily in a predetermined location, the quantity of a spacer can be reduced, consequently an image display device can be assembled easily.

[0084] Moreover, by aligning a spacer by vibration to the predetermined location on a pallet, a spacer can be aligned easily for a short time, and it becomes possible to perform a practical spacer array. Moreover, by using it combining two or more pallets, alignment can arrange a spacer with an easy posture and a spacer and an electrode plate can be combined easily. Therefore, constraint is not received in the configuration and combination posture of a spacer, but it becomes possible to arrange in a vacuum envelope efficiently in a high precision with the spacer of any configurations.

[0085] Furthermore, it is maintainable for a high location precision of an electrode plate and a spacer by fixing a spacer to spacer puncturing of an electrode plate by the fixing member. Moreover, the fixing member can stabilize potential distribution of the fixed-portion circumference by having conductivity while having the function as shock absorbing material in the opening section of spacer puncturing and a spacer.

[0086] When the spacer 15 15 of the configuration mentioned above, i.e., the spacer of the configuration equipped with the two level difference sections 22a and 22b, is used, two electrode plates 13 and 32 can be supported and positioned between the face panel 11 and a rear panel 12 with a spacer like the gestalt of the 2nd operation shown in drawing 21 .

[0087] In this case, one electrode plate 13 is arranged in the predetermined location, where [which was mentioned above] it is in the condition by which it was constituted like the gestalt of the 1st operation and the spacer 15 was inserted in each spacer puncturing 14 and level difference section 22a of a spacer is contacted. Moreover, the electrode plate 32 of another side has much electronic passage puncturing and the spacer puncturing 34 like the electrode plate 13, it is in the condition that the spacer 15 was inserted in each spacer puncturing 34, and where level difference section 22b of a spacer is contacted, it is arranged in the predetermined location.

[0088] In this case, the distance relation of the electrode plates 13 and 32, the face panel 11, and a rear panel 12 is determined by the distance of the lower limit side 24 of each spacer 15, and level difference section 22a, and the distance of the upper limit side 23 of a spacer, and level difference section 22b. Thereby, two electrode plates 13 and 32 set a predetermined clearance to the face panel 11 and a rear panel 12, and each other are formed in parallel.

[0089] When manufacturing the above image display devices, after engaging and fixing beforehand and making a spacer 15 and the electrode plates 13 and 32 unify by the same approach as the gestalt of the 1st operation, the approach of combining the assembly of this spacer and an electrode plate with the face panel 11 and a rear panel 12 is desirable.

[0090] Also in the gestalt of the 2nd operation constituted as mentioned above, each spacer engages with the electrode plates 13 and 32, and it holds these electrode plates in the predetermined location while each spacer 15 penetrated the electrode plates 13 and 32, was prolonged and is in contact with the face panel 11 and the rear panel 12. Therefore, while being able to arrange a spacer and an electrode plate easily in a predetermined location, the quantity of a spacer can be reduced, consequently an image display device can be assembled easily.

[0091] On the other hand, the spacer 15 may be formed so that the thickness of the level difference sections 22a and 22b may be mutually different, so that electronic passage puncturing of the electrode plates 13 and 32 and the level difference sections 22a and 22b of a spacer 15 may not interfere. For example, as shown in drawing 22 , the spacer 15 may be formed so that the direction of level difference section 22a by the side of a lower limit may become broad from level difference section 22b by the side of upper limit. It is ** and, as for each spacer 15, the up-and-down sense is restrained in this case.

[0092] Moreover, when only one sheet arranges an electrode plate, as shown in drawing 23 , each spacer 15 is good also as a configuration equipped only with one level difference section 22a. In this spacer 15, level difference section 22a was formed of the lobe 26 which protruded on the lower limit section of a spacer, and has turned to the upper limit side 23 side.

[0093] Or as shown in drawing 24 , level difference section 22a is good also as a configuration in which it was formed of the lobe 26 which protruded on the upper limit section of a spacer 15 and it turned [configuration] to the lower limit side 24 side. In this case, the lobe 26 is formed in the taper so that it may extend linearly toward the upper

limit side 23 from level difference section 22a. Such a spacer 15 becomes effective when the diameter of a spot of the electron emitted from the electron emission component 20 becomes large gradually toward a fluorescent substance screen side.

[0094] In addition, even when the spacer 15 as shown in drawing 22 thru/or drawing 24 is used, the same operation effectiveness as the gestalt of operation mentioned above can be acquired. Next, FED concerning the gestalt of implementation of the 3rd of this invention and its manufacture approach are explained. With the gestalt of the 3rd operation, the fixed approach of a spacer 15 for the electrode plate 13 is different.

[0095] Namely, as shown in drawing 25 , according to the gestalt of the 3rd operation, the fixing member 40 is arranged in the middle of level difference section 22a of a spacer 15, and the electrode plate 13. When it considers as such a configuration, with the gestalt of the 1st operation of the above-mentioned, it becomes possible to specify the location of the electrode plate 13 specified by level difference section 22a of a spacer 15 by the fixing member 40. As a result of a spacer's 15 giving top priority to the required accuracy of the height direction, this configuration is effective when stopping satisfying the dimensional accuracy required of level difference section 22a.

[0096] While making large level difference section 22a of a spacer 15 as much as possible with the above-mentioned configuration, it is desirable to narrow spacer puncturing 14 of the electrode plate 13 as much as possible. Moreover, since the fixing member 40 is arranged on 1st surface 13a of the electrode plate 13, spacer puncturing 14 can be freely made into a configuration in the range which can penetrate a spacer 15. And the arrangement relation of the fixing member 40 can be decided appropriately, and it becomes possible to stabilize potential distribution in the spacer 15 neighborhood. In addition, since the fixing member 40 is a conductive frit, the electrode plate 13, the fixing member 40, and the spacer 15 are switch-on electrically. Other configurations are the same as that of the gestalt of the 1st operation mentioned above, and the detailed explanation is omitted.

[0097] In the production process of such FED, it fixes to the electrode plate 13, after applying the fixing member 40 to each spacer 15. As shown in drawing 26 , in case the fixing member 40 is applied to a spacer 15, the fixture 81 for spreading is equipped with a spacer 15. This fixture 81 for spreading has the introductory way 82 which extended from external surface to each level difference section 22a neighborhood of a spacer 15. And it lets these introductory ways 82 pass, and the fixing member 40 is applied to level difference section 22a of a spacer 15. In addition, adhesion of a fixing member is prevented that each introductory way 82 forms fixture 81 the very thing for spreading with the ingredient to which the fixing member 40 cannot adhere easily, or by making the inside of an introductory way into the surface state to which the fixing member 40 cannot adhere easily.

[0098] Moreover, the die-length direction of the fixture 81 for spreading can be lengthened in the range which a manufacturing facility permits. Therefore, since a spacer 15 can be put in order in the direction which goes direct on the surface of drawing 26 , it becomes possible [applying the fixing member 40 to a spacer 15 in large quantities at once]. In addition, the introductory way 82 of the fixture 81 for spreading can also be considered as a partial opening while it can be prepared on the surface of drawing 26 succeeding a perpendicular direction.

[0099] Next, it arranges in the condition of having inserted in the spacer puncturing 14 of the electrode plate 13 the spacer 15 with which the fixing member 40 was applied. The fixing member 40 is calcinated in this condition, and the electrode plate 13 and a spacer 15 are fixed. In this case, as shown in drawing 27 , the electrode plate 13 and a spacer 15 are arranged at the burning tools 91 which specify each location. These burning tools 91 are equipped with the electrode plate backing plate 92 which specifies the location of the height direction of the electrode plate 13, and the load plate 93. The lobe 95 which amends the inclination of the projection spacer 15 is formed in the bore 94 which contains a spacer 15, and the bore 94 at the electrode plate backing plate 92.

[0100] In the process which the fixing member 40 calcinates, the frit which is the fixing member 40 is softened in a high temperature field, and the electrode plate 13 and a spacer 15 are arranged by burning tools 91 to a position. Under the present circumstances, between the electrode plate 13 and level difference section 22a of a spacer 15, it has predetermined thickness and the fixing member 40 is arranged. Moreover, as for the excessive fixing member 40, the direction push appearance of the root of the level difference section 22a of a spacer 15 is carried out. However, except a contact part with the electrode plate 13, since coverage is very little, in case the field of the fixing member 40 arranged at a spacer 15 does not almost have changing and applies the fixing member 40 to a spacer 15 using the fixture 81 for spreading, it can specify the spreading field strictly.

[0101] Therefore, the physical relationship of a spacer 15 and the fixing member 40 becomes uniform, and potential distribution near [spacer 15] each can also be made uniform and stable. Moreover, during baking, since location regulation is carried out so that it may not incline by the lobe 95 of the electrode plate backing plate 92, a spacer 15 is fixable to a predetermined location, even if it changes the electrode plate 13 and the fixing member 40 by baking.

After a baking process is completed, the formed electrode plate with a spacer is combined with a panel etc. by the same approach as the gestalt of the 1st operation mentioned above.

[0102] In the gestalt of each operation mentioned above, although the spacer was considered as the configuration fixed to an electrode plate using a fixing member, it is good also as a configuration fixed by pressing fit in spacer puncturing of an electrode plate. That is, according to the gestalt of implementation of the 4th of this invention, as shown in drawing 28 , the projection 96 for immobilization of the pair for fixing the electrode plate 13 and a spacer 15 was formed in the spacer 15 by one, and has projected from both sides of a spacer from level difference section 22a by alienation to it, respectively.

[0103] Each projection 96 for immobilization is formed so that the narrow diameter portion 97 where the area of the spacer puncturing 14 of the electrode plate 13 serves as min may be contacted in dozens of micrometers or less. When this amount of contact combines a spacer 15 and the electrode plate 13, it is desirable to consider as the amount of contact which neither fluctuation of a member dimension nor destruction of a member produces, and it is set as an optimum value in several micrometers to dozens of micrometers according to the member property of a spacer 15 and the electrode plate 13.

[0104] And in case the spacer puncturing 14 of the electrode plate 13 is equipped with a spacer 15, after the projection 96 for immobilization contacts the narrow diameter portion 97 of spacer puncturing, by pushing in into the spacer puncturing 14 further, putting a pressure on a spacer 15, a spacer 15 is pressed fit in spacer puncturing and fixed to the electrode plate 13.

[0105] After press fit of a spacer 15, the projection 96 for immobilization contacts the inside of the narrow diameter portion 97 of the spacer puncturing 14, and level difference section 22a of a spacer 15 contacts 1st surface 13a of the electrode plate 13. Thereby, the electrode plate 13 is put and a spacer and the electrode plate of each other are fixed by the projection 96 for immobilization, and level difference section 22a. And if it is the above-mentioned structure, the location of a spacer 15 will not be changed to the electrode plate 13.

[0106] In addition, in a configuration of that a part of projection 96 for immobilization and level difference section 22a contacted the electrode plate 13 as mentioned above, there is a possibility that the electrode plate 13 may displace, in the interior of FED of a vacua, but if such a variation rate is dozens of micrometers or less, it will not have big effect on image display. Therefore, as for the dimension of a spacer 150 and the electrode plate 13, it is desirable to be formed in the precision of less than dozens of micrometers.

[0107] In the gestalt of the 3rd operation, other configurations and production processes are the same as that of the gestalt of operation mentioned above, and the detailed explanation is omitted. And while according to the gestalt of the 3rd operation the fixing member for fixing a spacer 15 and the electrode plate 13 becomes unnecessary and being able to aim at reduction of member cost, it becomes reducible [the number of production processes]. Therefore, an image display device is utilizable by the easy manufacture approach in low cost.

[0108] In addition, this invention is variously deformable within the limits of this invention, without being limited to the gestalt of operation mentioned above. For example, this invention is also applicable not only to FED of a high-voltage mold but other image display devices. Moreover, although each spacer was considered as the configuration equipped with the level difference section as the stop section in the gestalt of operation mentioned above, it is good also as a configuration which makes the stop section the part which engages with spacer puncturing formed in the electrode plate among spacers, will not come this stop section and spacer puncturing if the level difference section is prepared by [predetermined] setting up for inserting each other in, and holds an electrode plate with a spacer.

[0109] Moreover, although considered as the manufacture approach which combines the spacer which aligned with an electrode plate with the gestalt of operation mentioned above, in the case of the image display device which does not use an electrode plate, it is also possible to arrange the spacer which aligned directly to a panel.

[0110]

[Effect of the Invention] As explained in full detail above, while being able to arrange a spacer and an electrode plate in a predetermined location easily by forming two or more spacers which penetrate an electrode plate, respectively and are prolonged, and stopping an electrode plate with these spacers according to this invention, the quantity of a spacer can be reduced, and assembly is easy and can offer the cheap image display device and its manufacture approach of a manufacturing cost.

[0111] Moreover, by preparing the level difference section in each spacer, and performing location regulation of an electrode plate by this level difference section, the physical relationship of a spacer and an electrode plate can be specified correctly, and spacing of a face panel and a rear panel, and an electrode plate can be set up easily and correctly. Therefore, while being able to arrange a spacer easily, an image display device with easy assembly can be

offered.

[Translation done.]